

Microplastic transport and accumulation in boreal aquatic environments

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Microplastics are recently identified as emerging pollutants and have evoked concerns regarding environmental, ecological and human health. Earliest findings of microplastics are already reported from 70's, however the term was suggested only at 2004 by prof. Richard Thompson. The term microplastic refers to plastic particles of size less than 5 mm, either directly produced into small size (e.g. pellets and microbeads) or degraded into small pieces via physical and chemical degradation of plastic products. At present, microplastics are reported in all kinds of natural environments from deep marine basins up to remote mountain areas and arctic ice. Majority of the microplastics are produced on land, released from traffic, agriculture, industry, and waste water treatment plants. Once released to nature, they become transported and accumulated in water bodies like any natural particles. Equally, as natural processes can transport and deposit particles depending on the particle size, density and biogeochemical activity, are similar processes expected to influence on microplastic particles fate in water bodies. Like seasonal variation controls the sediment availability and deposition of any natural particles, it seems that annual cycles strongly influences on microplastics as well. Plastic materials are heterogenic group of materials with their density varying from 0.89 (polypropylene) to 2.2 (teflon) g cm⁻³. The most common plastic materials found from natural sediments are polyethylene, and polypropylene, which are the most produced and used materials, both having density less than that of water. There is growing number of evidence pointing towards the biogenic and biogeochemical processes such as biofouling, flocculation and aggregation enhancing the sinking and sedimentation of these light particles. However, as majority of studies report microplastic concentrations from sediments, the detailed processes influencing on accumulation, flux rates and annual cycles as well as influence of climate remain largely unknown. Sediment traps and varved sediment records are efficient tools to assess the past microplastic accumulation rates as well as the processes beyond the annual cycles of microplastic deposition. Such values are crucial for future scenarios involving climate change (especially hydroclimatic conditions), intensive land use and globally increasing plastic production.